Machine Learning and Tensorflow

A Introduction to new thinking behind programing

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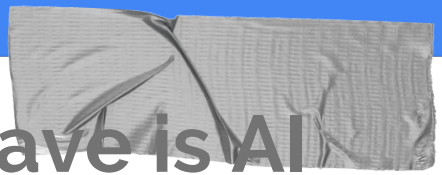
MS of CS, and other majors, 16 years on IT, work @Optum Technology

Languages: C++, Java, Scala, C#, Javascript (TypeScript), Python, Swift. Certified Sun Enterprise Architecture

Current Interest: Big Data, ML, Micro Services, Mobile with Ionic

Hobby: Taiji (13 generation of Chen Taiji Family)



1. Next wave is AI
2. ML(tradition), Deep ML(representation)
3. Basic concept of Tensorflow
4. Demo of simple training and Prediction
5. Letter Recognition
6. CNN
7. Inception

Why AI is so important?

They are everywhere now

From traditional programming to ML

Alpha Go

My experience

Types of ML Problems:
Tradition ML vs Representation ML (Deep Learning)

Classification

(spam or ham)

Regression

(predict price)

Clustering

(customer grouping)

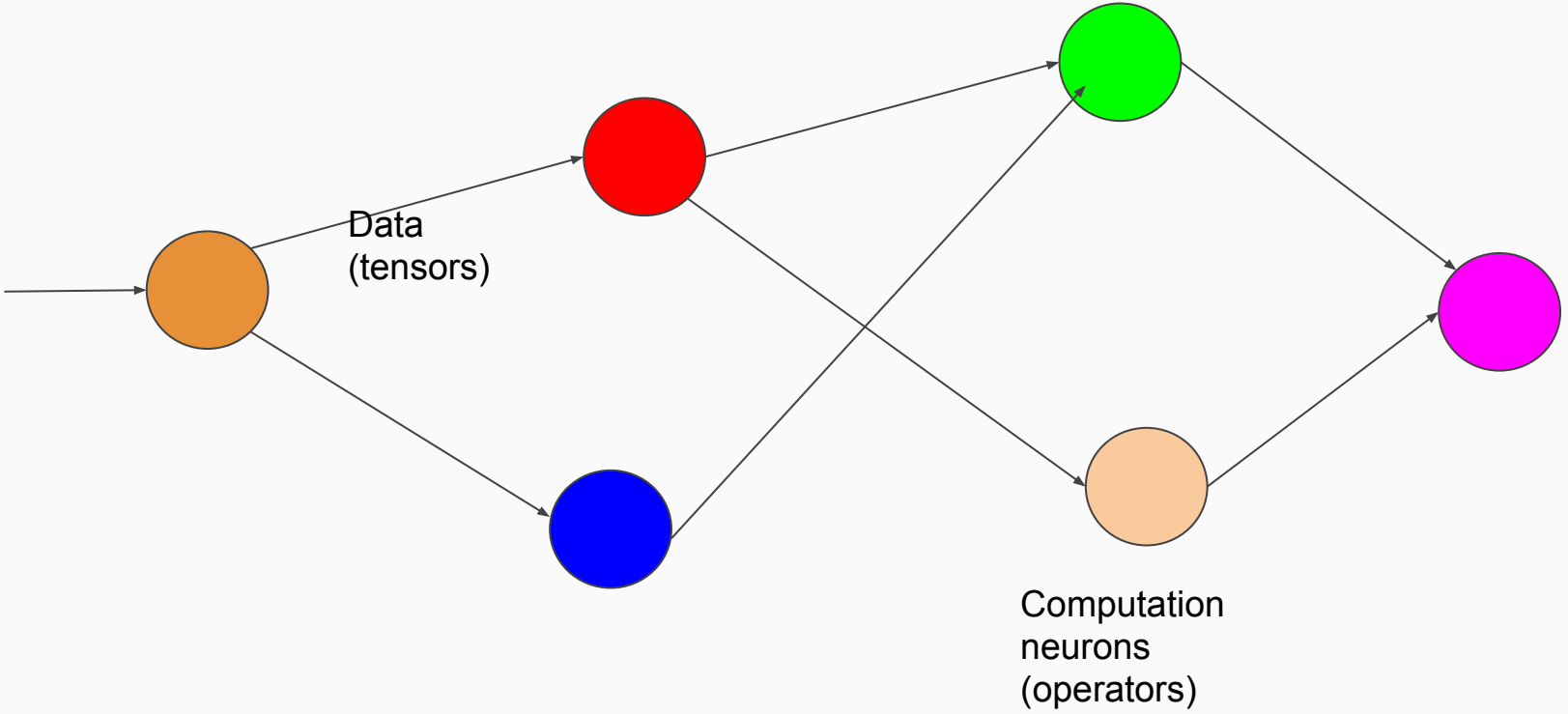
Recommendations

(Amazon shopping)

Tensor Flow:
An interface for expressing machine learning algorithms and an implementation for executing such algorithms.
Tensorflow.org
Deep learning and neural network
Language Interface: Python, C++, Java, Go
Execution Environment: CPU, GPU, TPU; local, distributed, cloud

Everything is Graph: build the network

Tensorflow: data transformed on the way



Demo:

Env: Python 3.5.2 for windows; tensorflow 1.0

SimpleMath.py for math computation of tensorflow: tensorflow session

Demo of tensorboard

Computation Graph of (a * b) + c

Tensor is n-dimension structure

n = 0 Single value
n = 1 List of values
n = 2 Matrix of values
n = 3 Cube c = [[[1,5,6], [5,3,4]],[[9,3,5], [3,4,9]],[[4,3,2],[3,6,7]]]

n = 4 …..
Rank, Shape [3, 2, 3], data type
With primitive values

Demo of Simple Prediction -- Linear regression with single neuron

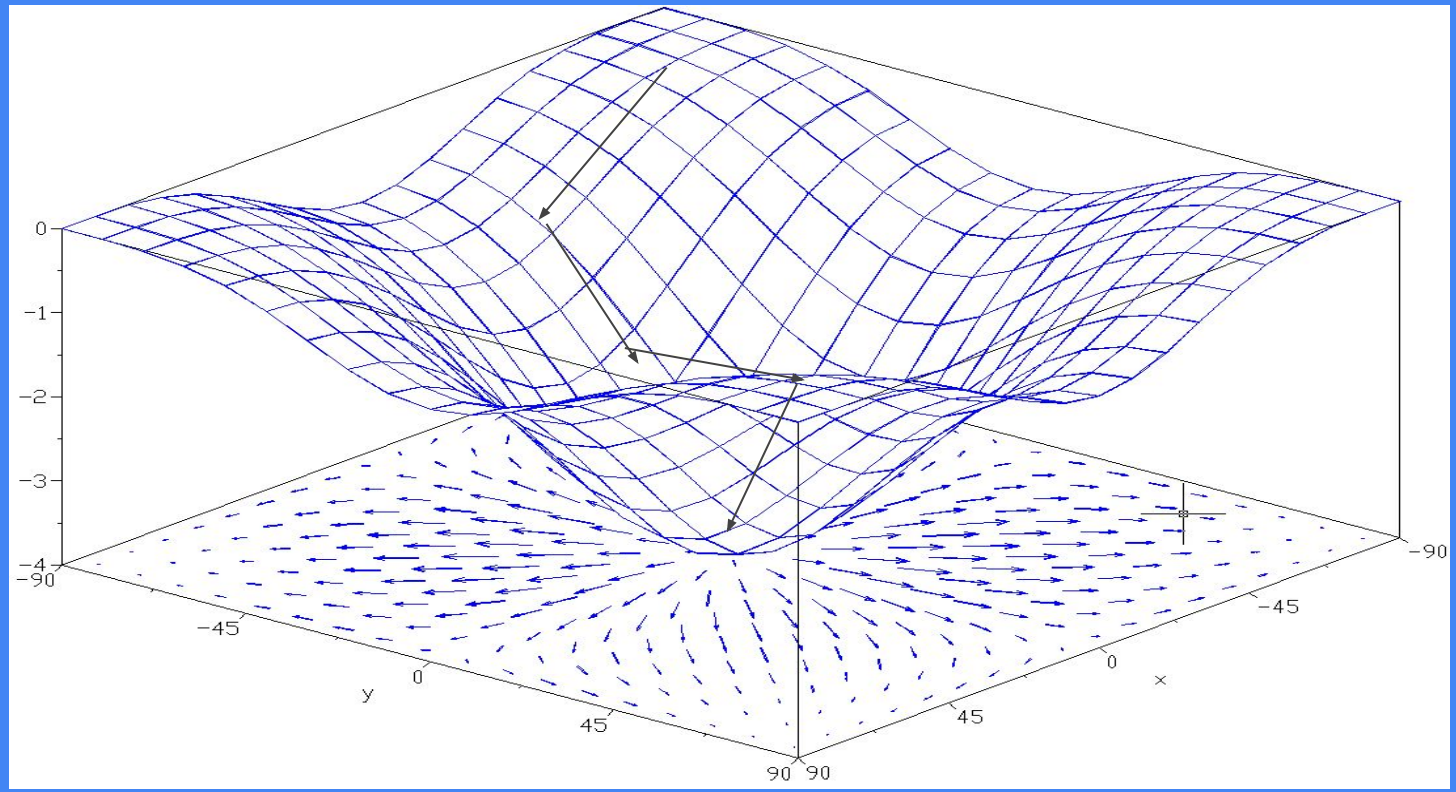
Generated house size and price data

Price = (sizeFactor * size) + priceOffset

Mean Square Error

Gradient Descent Optimizer

Gradient Descent



Training Steps

Story for illustration purposes only

Prepared Data

Inference

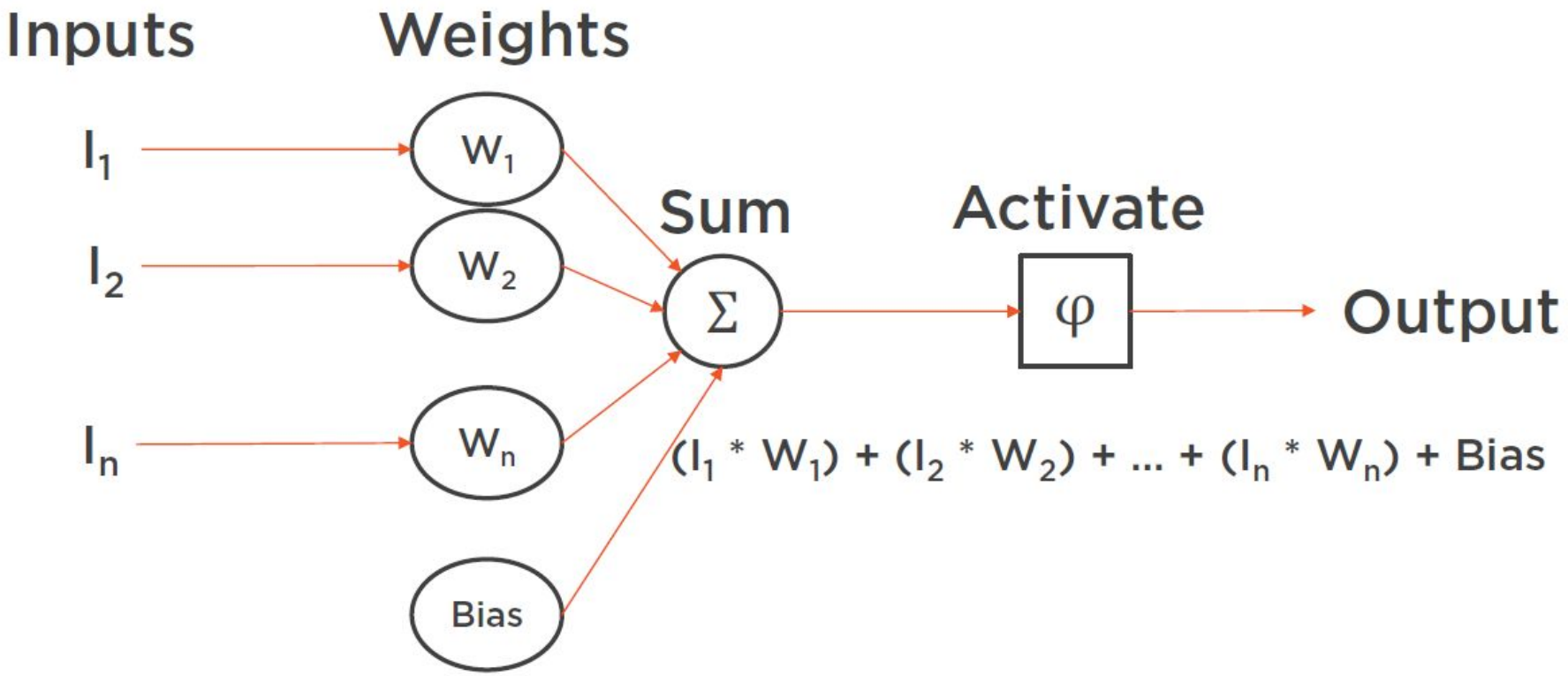
Loss Measurement

Optimize to Minimize Loss

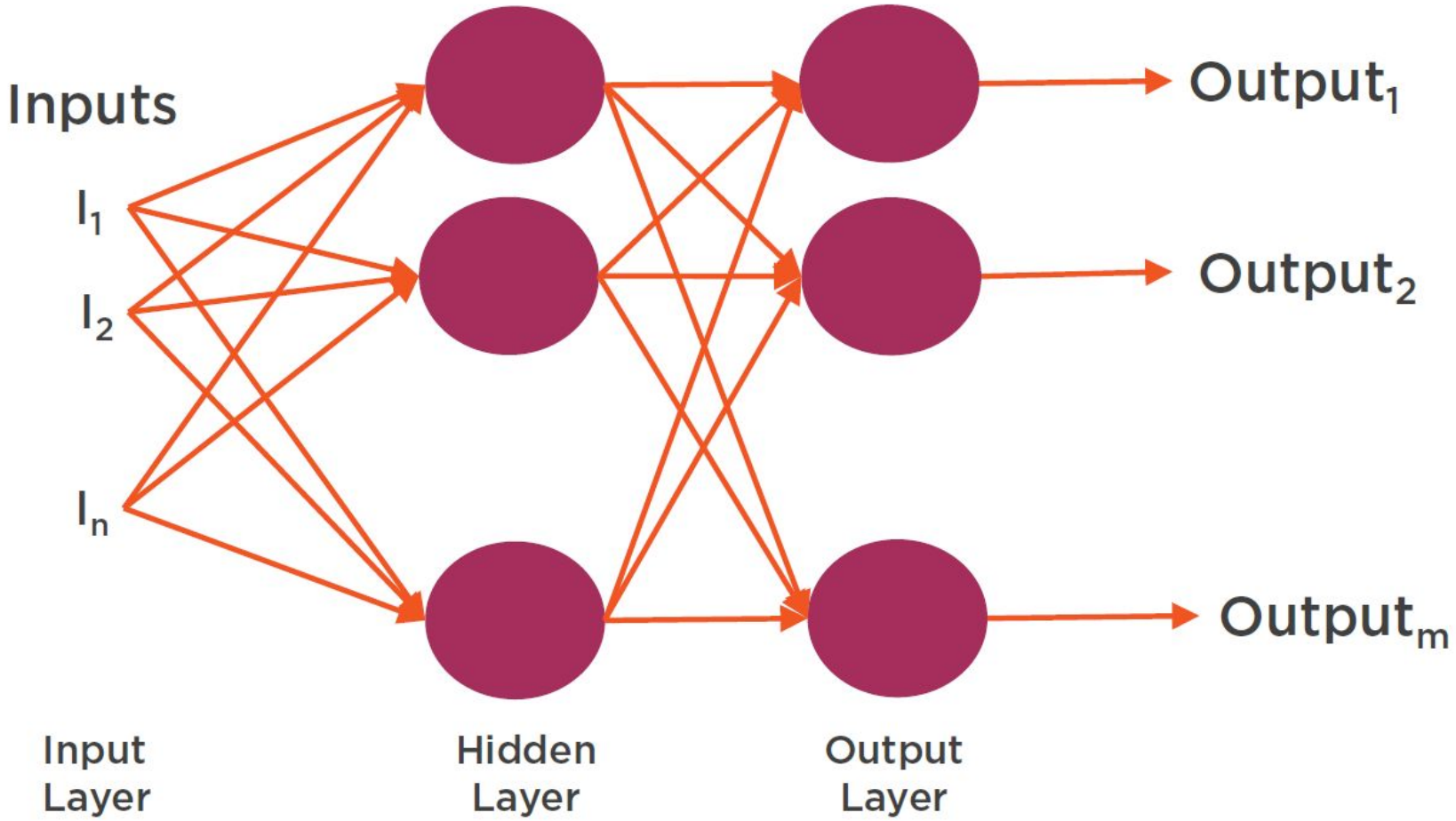
Neural Network : Convolutional Neural Network, Deep Neural Network

Tensorflow makes NN very simple

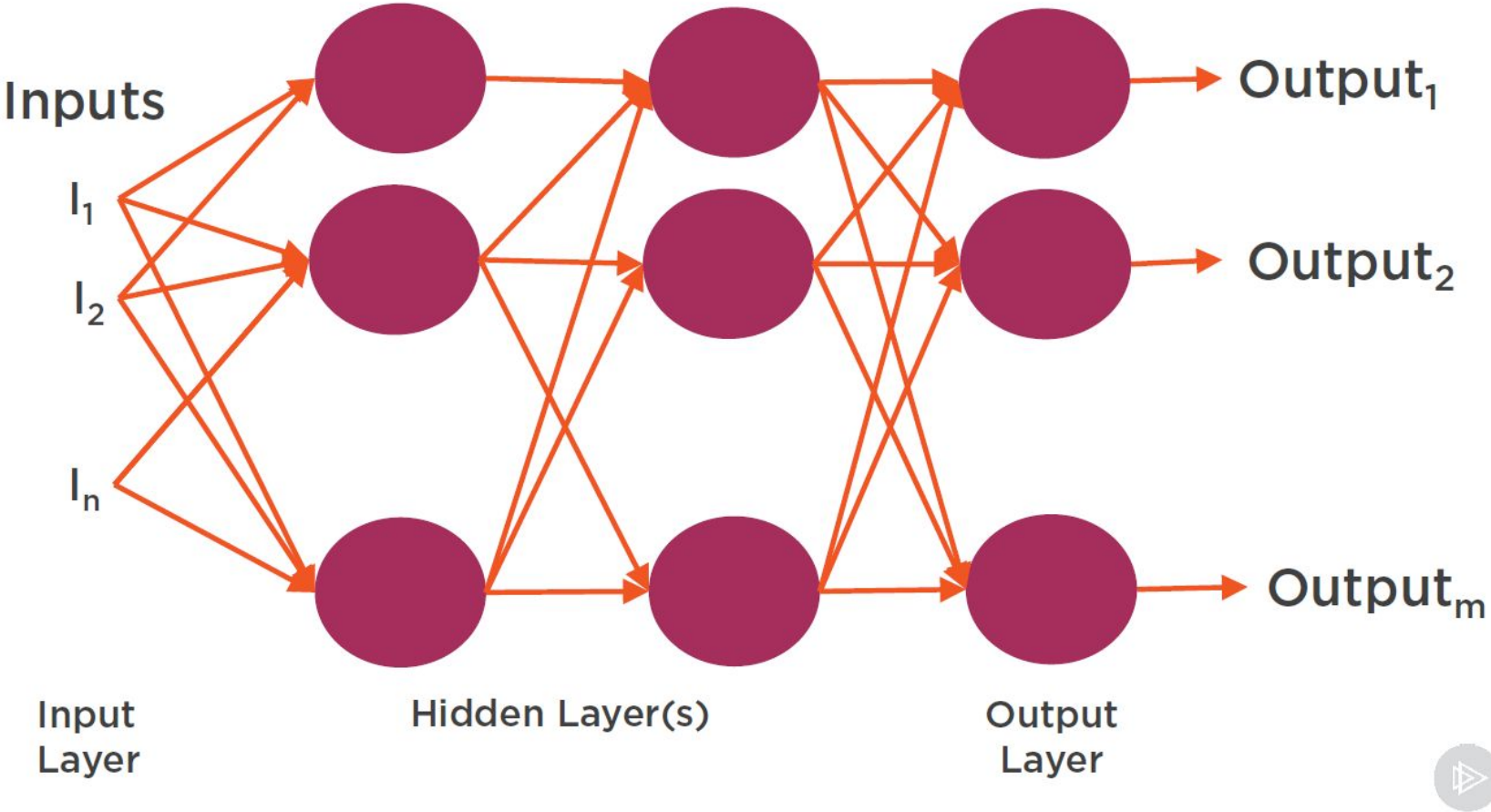
Neuron Architecture



Neural Network Layers



Deep Neural Network Layers



Demo of written letter recognition

Logistic regression

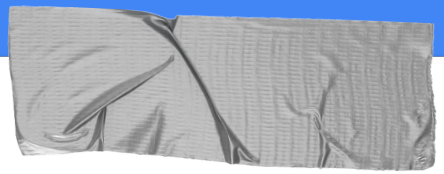
Learning Transfer - Inception

Image DNN error rate 3.46% vs human 5.1%
Can we transfer knowledges between humans easily in the future?
IoB (internet of Brain)

Demo: use Google pre-train data to recognize flowers

Deep blue -> Alpha Go
Rule base (Prolog) Gaming tree -> Pattern Recognition
Monte Carlo tree search

Rethink the problem



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